

## ABSTRACT

An apparatus for carrying out a process of converting hydrocarbon fuel to a hydrogen rich gas including a first heat exchanger for heating the hydrocarbon fuel to produce a heated hydrocarbon fuel, a first desulfurization reactor for reacting the heated hydrocarbon fuel to produce a substantially desulfurized hydrocarbon fuel, a manifold for mixing the substantially desulfurized hydrocarbon fuel with an oxygen containing gas to produce a fuel mixture, a second heat exchanger for heating the fuel mixture to produce a heated fuel mixture, an autothermal reactor including a catalyst for reacting the heated fuel mixture to produce a first hydrogen containing gaseous mixture, a second desulfurization reactor for reacting the first hydrogen containing gaseous mixture to produce a second hydrogen containing gaseous mixture that is substantially desulfurized, a water gas shift reactor for reacting the second hydrogen containing gaseous mixture to produce a third hydrogen containing gaseous mixture with a substantially decreased carbon monoxide content, and a selective oxidation reactor for reacting the third hydrogen containing gaseous mixture to produce the hydrogen rich gas.